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Yamamoto et al.

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(54) **VIDEO INTERCOM DEVICE**

(71) Applicant: **PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.**, Osaka (JP)

(72) Inventors: **Takashi Yamamoto**, Fukuoka (JP); **Shinji Fukuda**, Fukuoka (JP); **Ken Ohbuchi**, Fukuoka (JP)

(73) Assignee: **PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.**, Osaka (JP)

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Apr. 28, 2015 (JP) 2015-091678

(51) **Int. Cl.**
H04N 7/18 (2006.01)
H04N 7/14 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 7/147*** (2013.01)

(58) **Field of Classification Search**
CPC combination set(s) only.
See application file for complete search history.

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Primary Examiner — Joseph J Nguyen
Assistant Examiner — Phung-Hoang J Nguyen
(74) *Attorney, Agent, or Firm* — Greenblum & Bernstein, P.L.C.

(57) **ABSTRACT**

Provided is a video intercom device for suppressing electric power consumption. The video intercom device adopts a configuration where the video intercom device switches between a first communication method by which an indoor master unit or a telephone master unit and a front door slave unit performs wireless communication under a predetermined condition, and a second communication method with electric power consumption lower than that of the first communication method, the first communication method is switched to the second communication method when the indoor master unit registers the front door slave unit, and the second communication method is switched to the first communication method when a telephone master unit registers the front door slave unit.

12 Claims, 15 Drawing Sheets

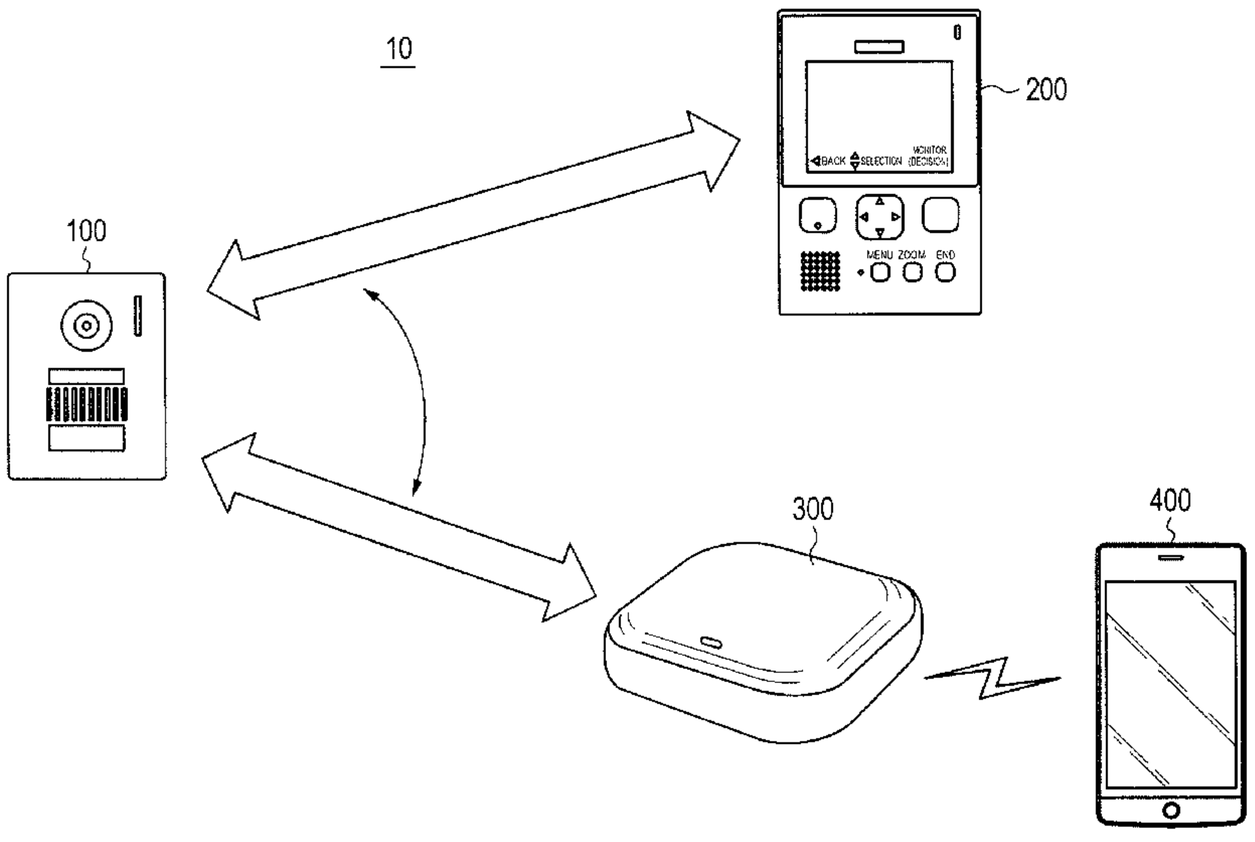

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FIG. 1

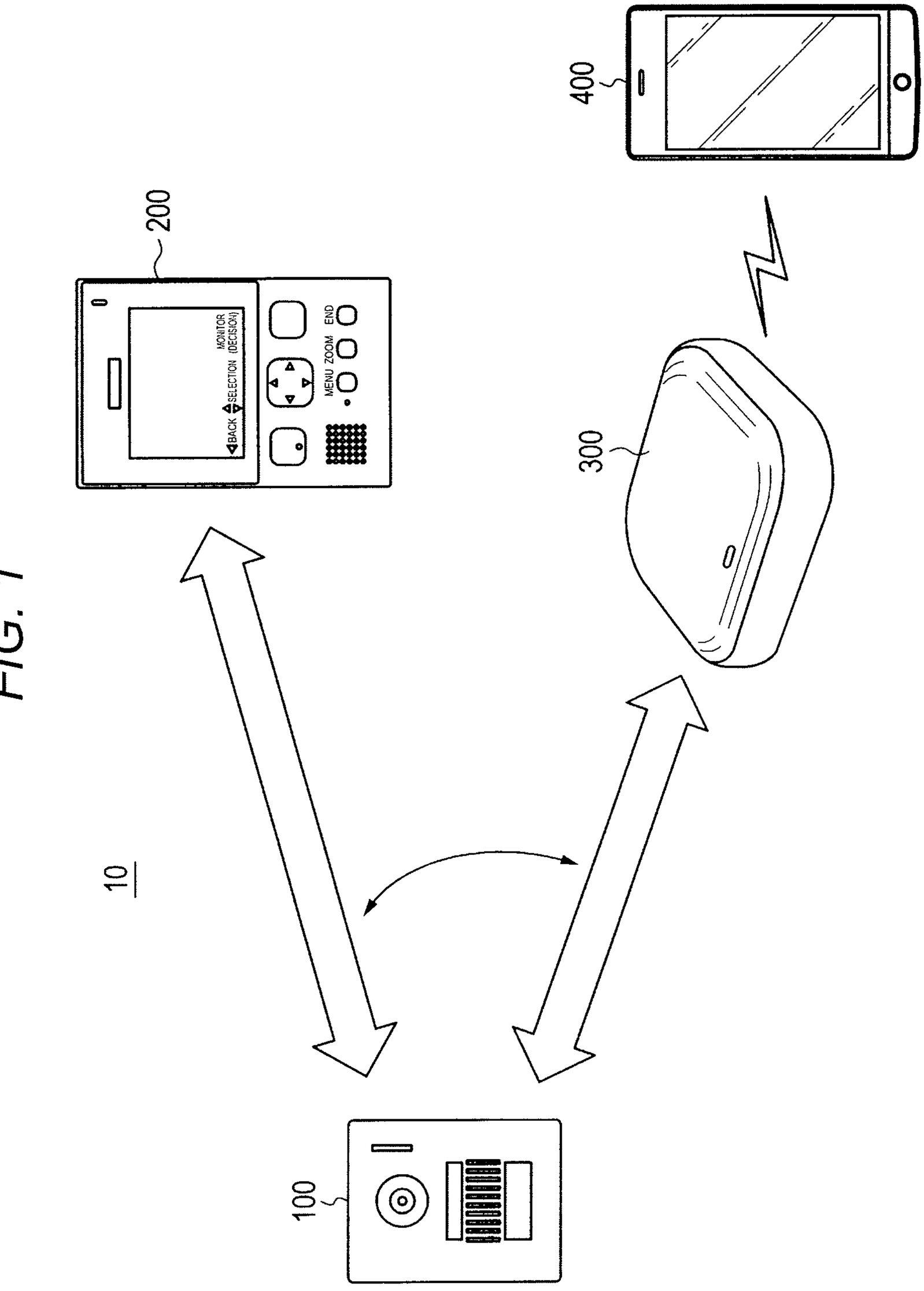

400
200
MONITOR
SELECTION (DECISION)
BACK
MENU ZOOM END
300
10
100

FIG. 2

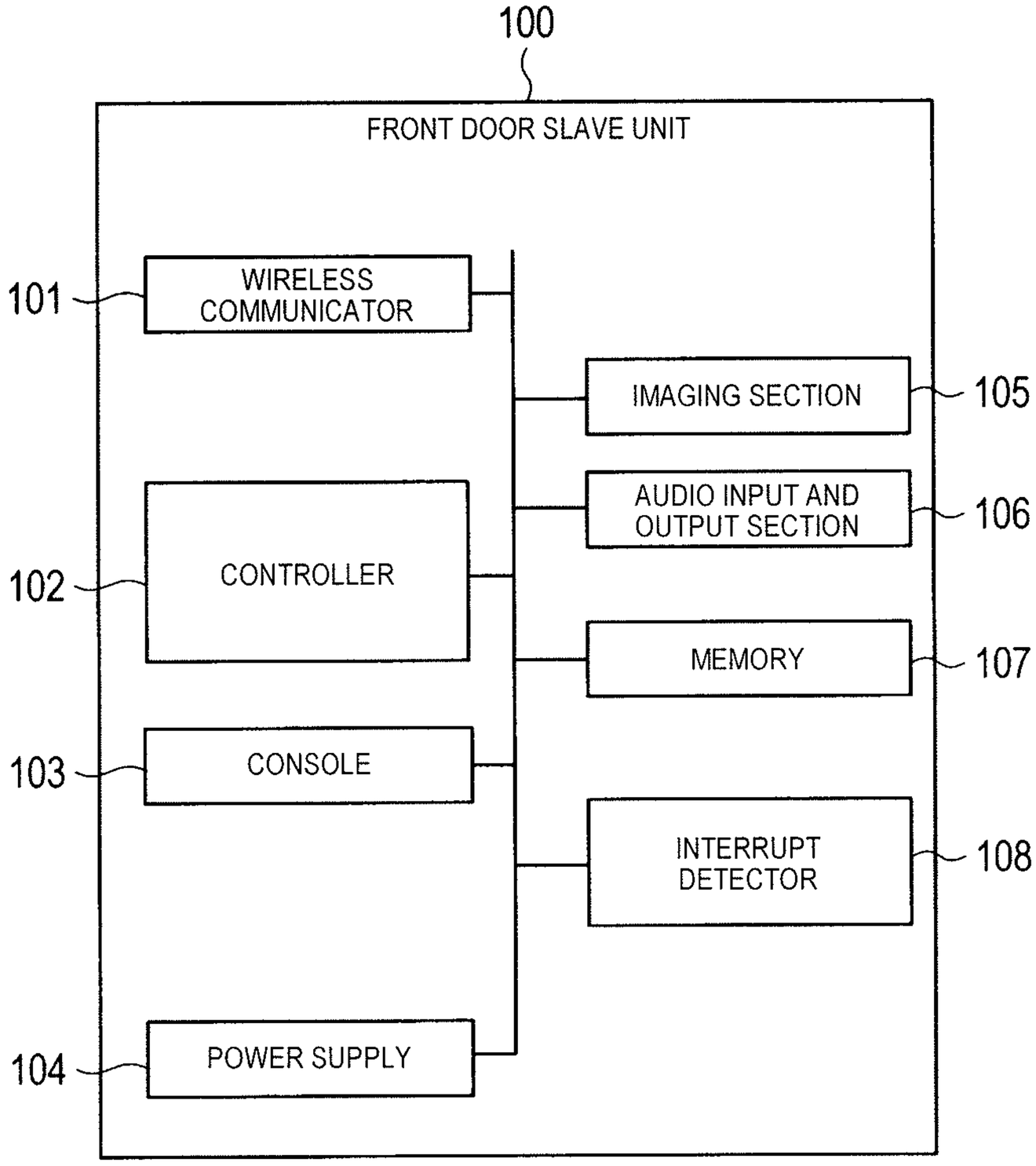

100
FRONT DOOR SLAVE UNIT
101
WIRELESS COMMUNICATOR
102
CONTROLLER
103
CONSOLE
104
POWER SUPPLY
IMAGING SECTION
105
AUDIO INPUT AND OUTPUT SECTION
106
MEMORY
107
INTERRUPT DETECTOR
108

FIG. 3

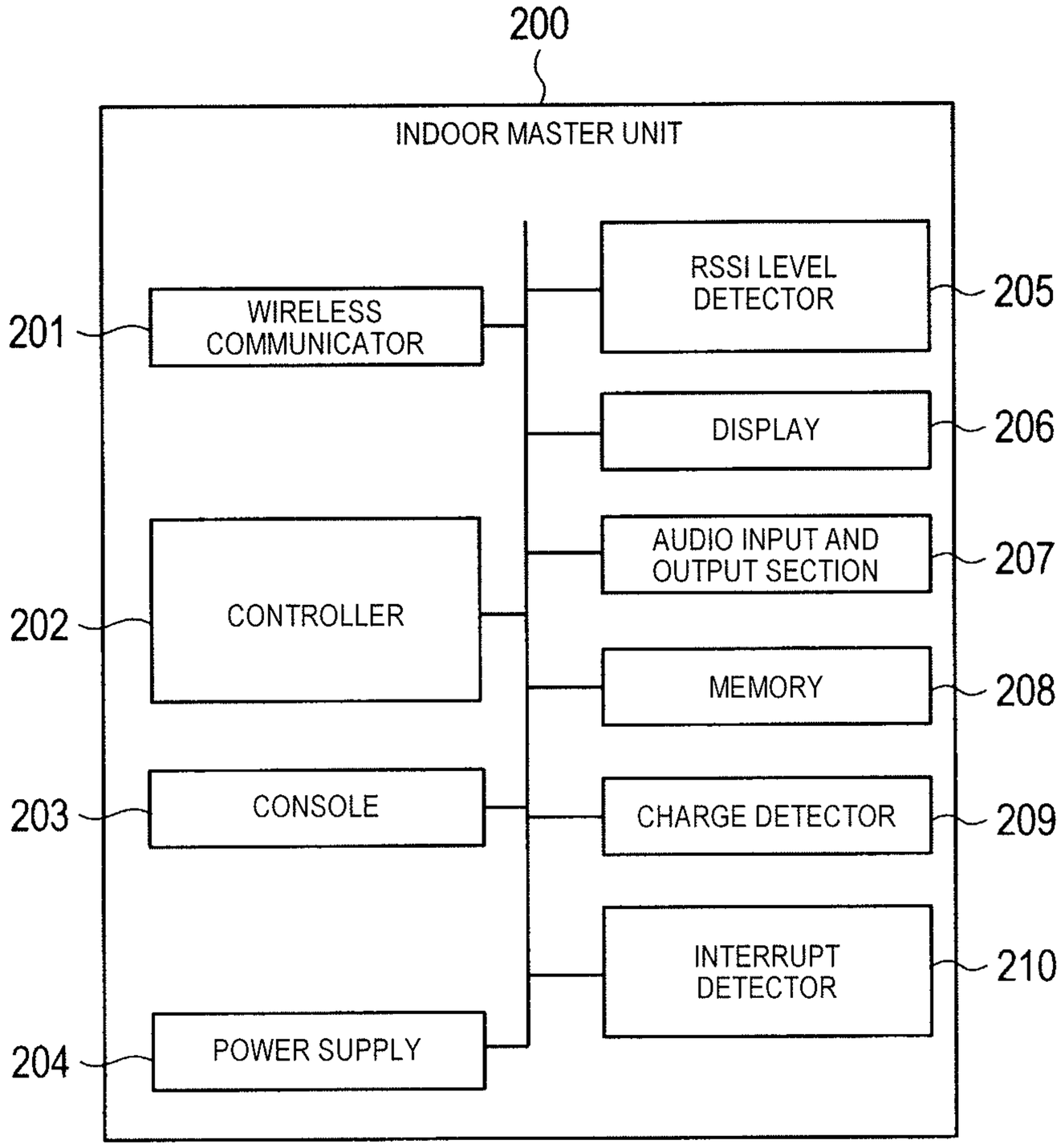

200
INDOOR MASTER UNIT
201
WIRELESS COMMUNICATOR
202
CONTROLLER
203
CONSOLE
204
POWER SUPPLY
RSSI LEVEL DETECTOR
205
DISPLAY
206
AUDIO INPUT AND OUTPUT SECTION
207
MEMORY
208
CHARGE DETECTOR
209
INTERRUPT DETECTOR
210

FIG. 4

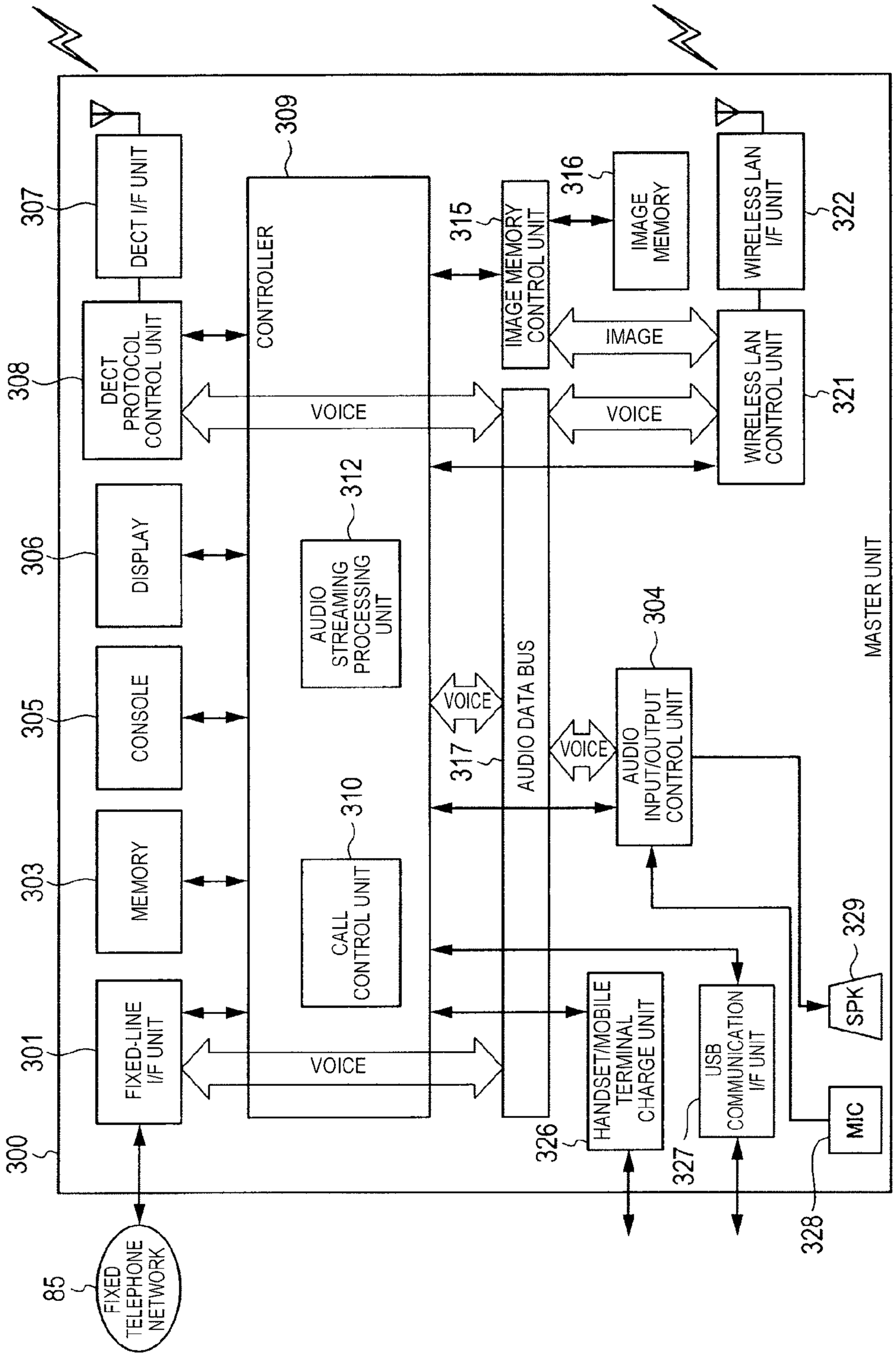

MASTER UNIT
300
DECT I/F UNIT
307
DECT PROTOCOL CONTROL UNIT
308
DISPLAY
306
CONSOLE
305
MEMORY
303
FIXED-LINE I/F UNIT
301
FIXED TELEPHONE NETWORK
85
CONTROLLER
309
AUDIO STREAMING PROCESSING UNIT
312
CALL CONTROL UNIT
310
VOICE
315
IMAGE MEMORY CONTROL UNIT
IMAGE
316
IMAGE MEMORY
WIRELESS LAN I/F UNIT
322
WIRELESS LAN CONTROL UNIT
321
VOICE
317
AUDIO DATA BUS
AUDIO INPUT/OUTPUT CONTROL UNIT
304
HANDSET/MOBILE TERMINAL CHARGE UNIT
326
USB COMMUNICATION I/F UNIT
327
SPK
329
MIC
328

FIG. 5

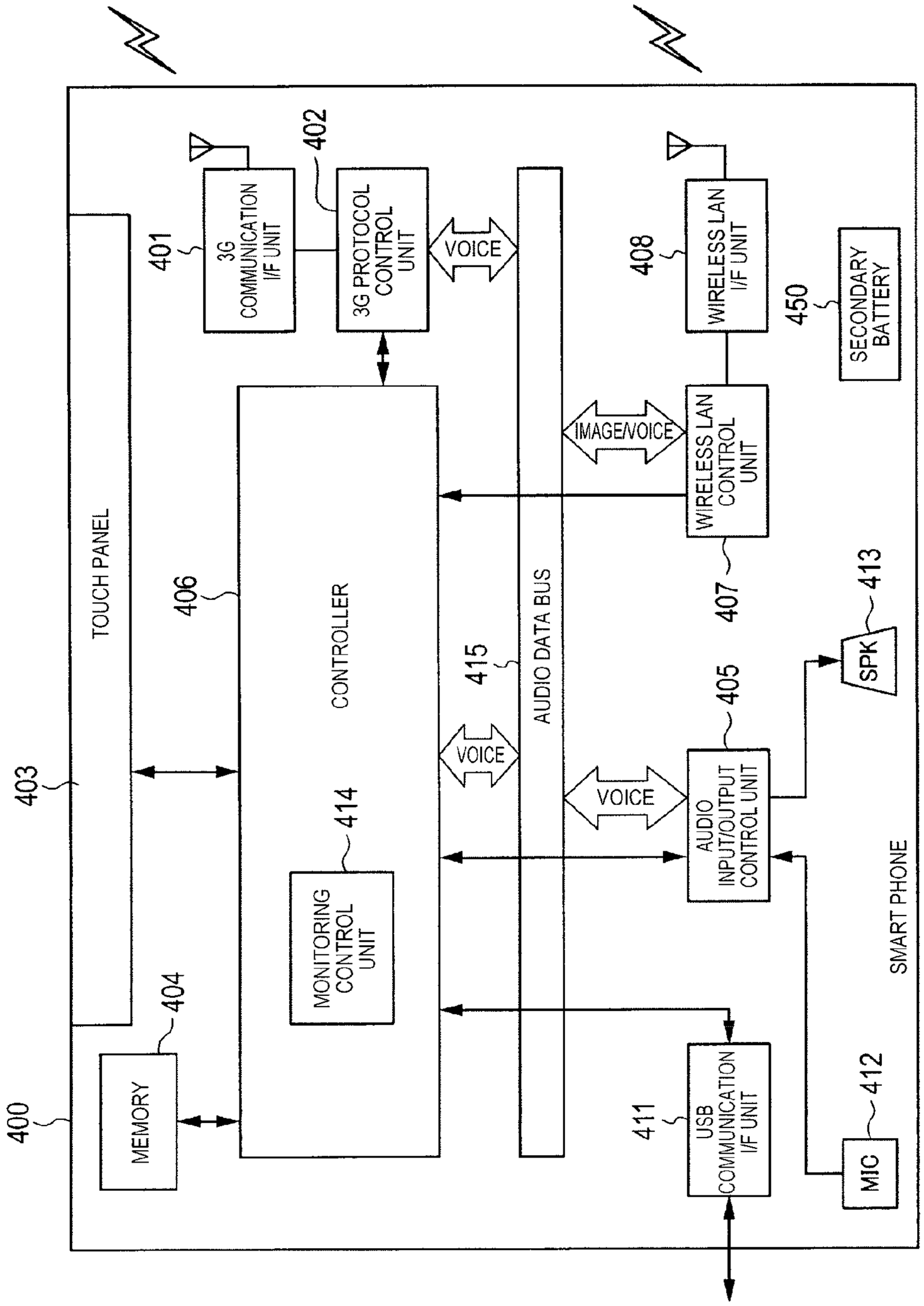

400
403
TOUCH PANEL
404
MEMORY
406
CONTROLLER
414
MONITORING CONTROL UNIT
401
3G COMMUNICATION I/F UNIT
402
3G PROTOCOL CONTROL UNIT
VOICE
415
AUDIO DATA BUS
VOICE
VOICE
IMAGE/VOICE
408
WIRELESS LAN I/F UNIT
407
WIRELESS LAN CONTROL UNIT
405
AUDIO INPUT/OUTPUT CONTROL UNIT
411
USB COMMUNICATION I/F UNIT
450
SECONDARY BATTERY
413
SPK
412
MIC
SMART PHONE

FIG. 6

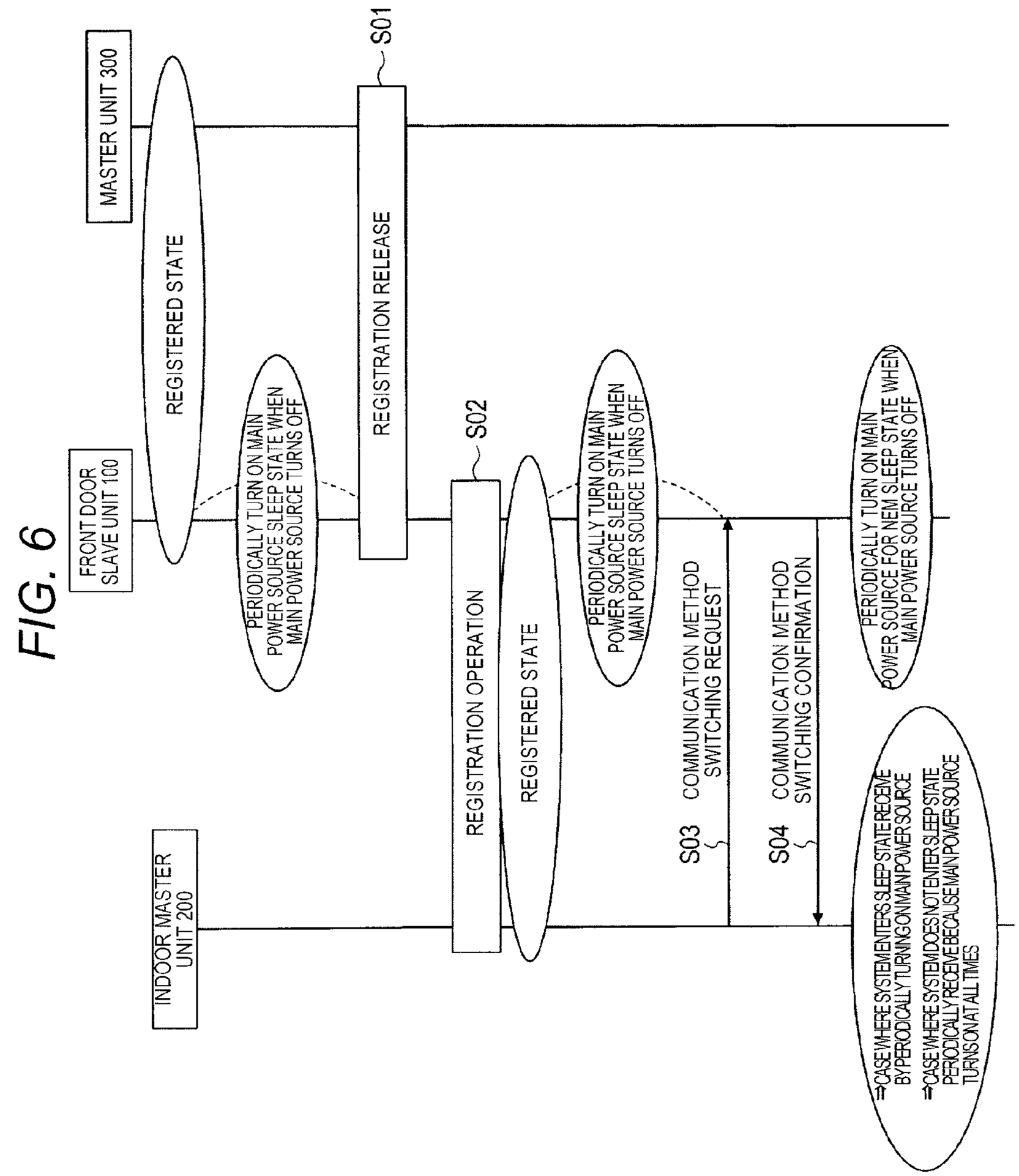

MASTER UNIT 300
FRONT DOOR SLAVE UNIT 100
INDOOR MASTER UNIT 200
S01
REGISTERED STATE
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
REGISTRATION RELEASE
S02
REGISTRATION OPERATION
REGISTERED STATE
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
S03 COMMUNICATION METHOD SWITCHING REQUEST
S04 COMMUNICATION METHOD SWITCHING CONFIRMATION
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
⇒CASE WHERE SYSTEM ENTERS SLEEP STATE RECEIVE BY PERIODICALLY TURNING ON MAIN POWER SOURCE
⇒CASE WHERE SYSTEM DOES NOT ENTER SLEEP STATE PERIODICALLY RECEIVE BECAUSE MAIN POWER SOURCE TURNS ON AT ALL TIMES

FIG. 7

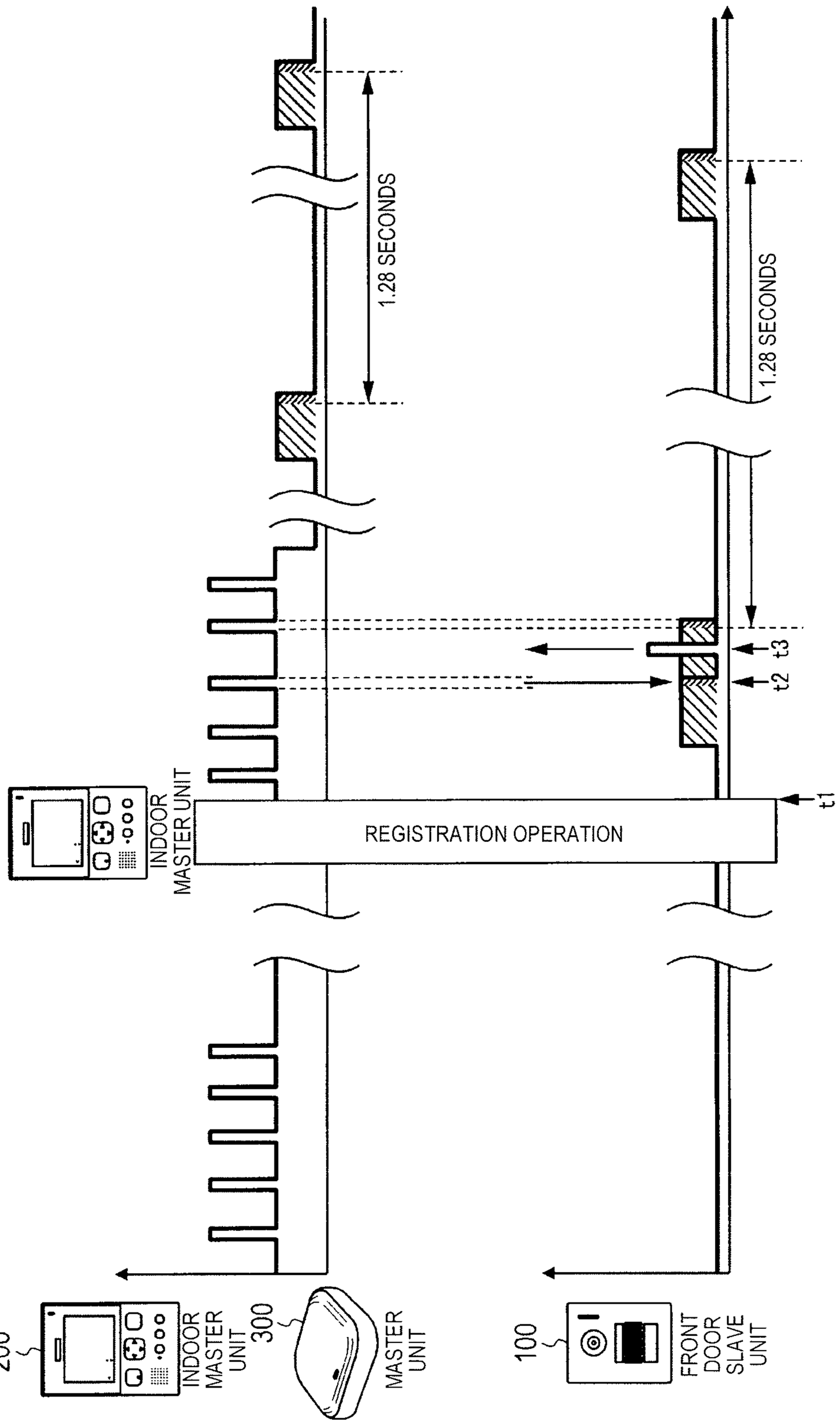

1.28 SECONDS
1.28 SECONDS
t3
t2
t1
REGISTRATION OPERATION
INDOOR MASTER UNIT
200
300
MASTER UNIT
100
FRONT DOOR SLAVE UNIT

FIG. 8

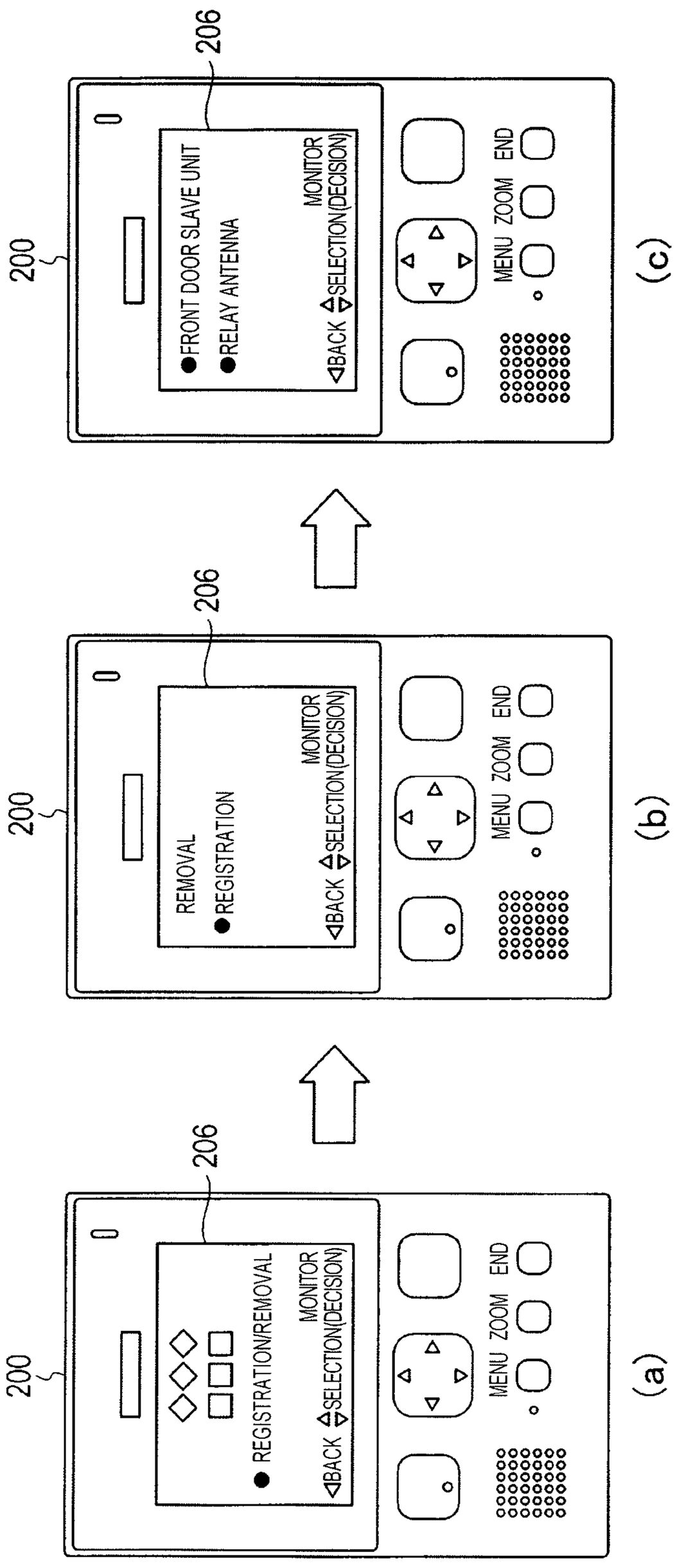

200
206
FRONT DOOR SLAVE UNIT
RELAY ANTENNA
MONITOR
BACK
SELECTION(DECISION)
MENU ZOOM END
(c)
200
206
REMOVAL
REGISTRATION
MONITOR
BACK
SELECTION(DECISION)
MENU ZOOM END
(b)
200
206
REGISTRATION/REMOVAL
MONITOR
BACK
SELECTION(DECISION)
MENU ZOOM END
(a)

FIG. 9

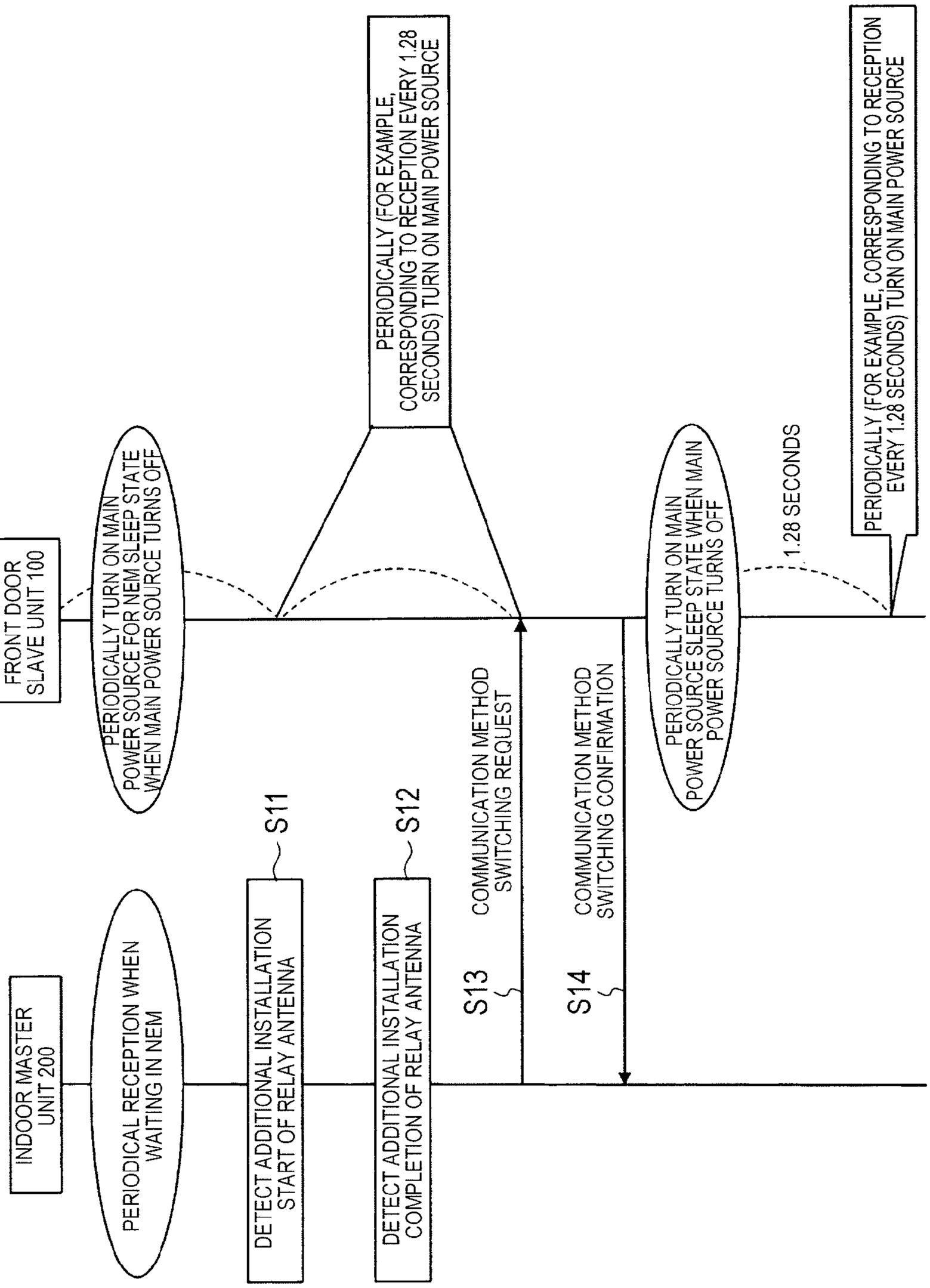

FRONT DOOR SLAVE UNIT 100
INDOOR MASTER UNIT 200
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICAL RECEPTION WHEN WAITING IN NEM
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
DETECT ADDITIONAL INSTALLATION START OF RELAY ANTENNA
S11
S12
COMMUNICATION METHOD SWITCHING REQUEST
DETECT ADDITIONAL INSTALLATION COMPLETION OF RELAY ANTENNA
COMMUNICATION METHOD SWITCHING CONFIRMATION
S13
S14
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
1.28 SECONDS
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE

FIG. 10

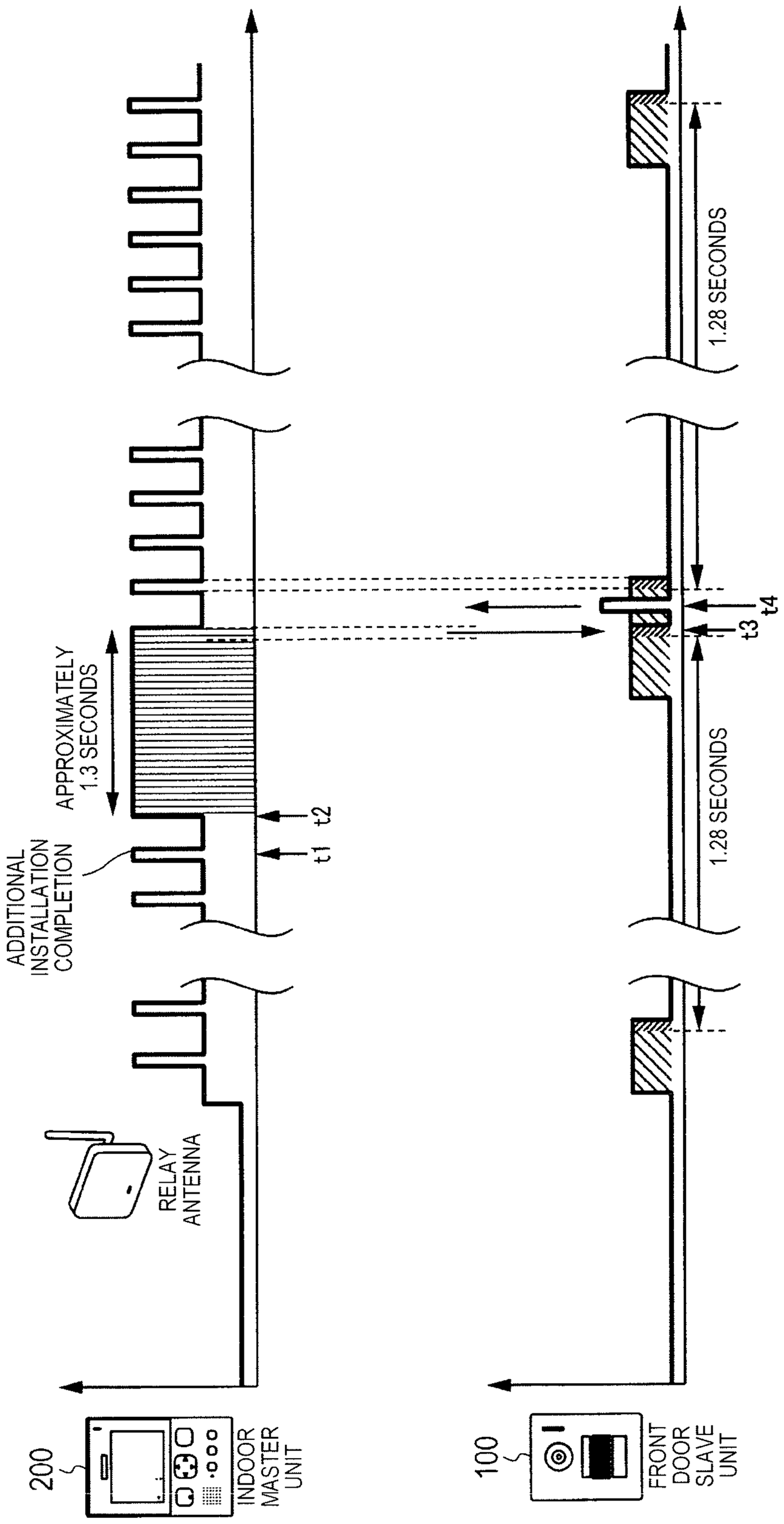

1.28 SECONDS
APPROXIMATELY
1.3 SECONDS
ADDITIONAL
INSTALLATION
COMPLETION
t1 t2
t3 t4
1.28 SECONDS
RELAY
ANTENNA
200
INDOOR
MASTER
UNIT
100
FRONT
DOOR
SLAVE
UNIT

FIG. 11

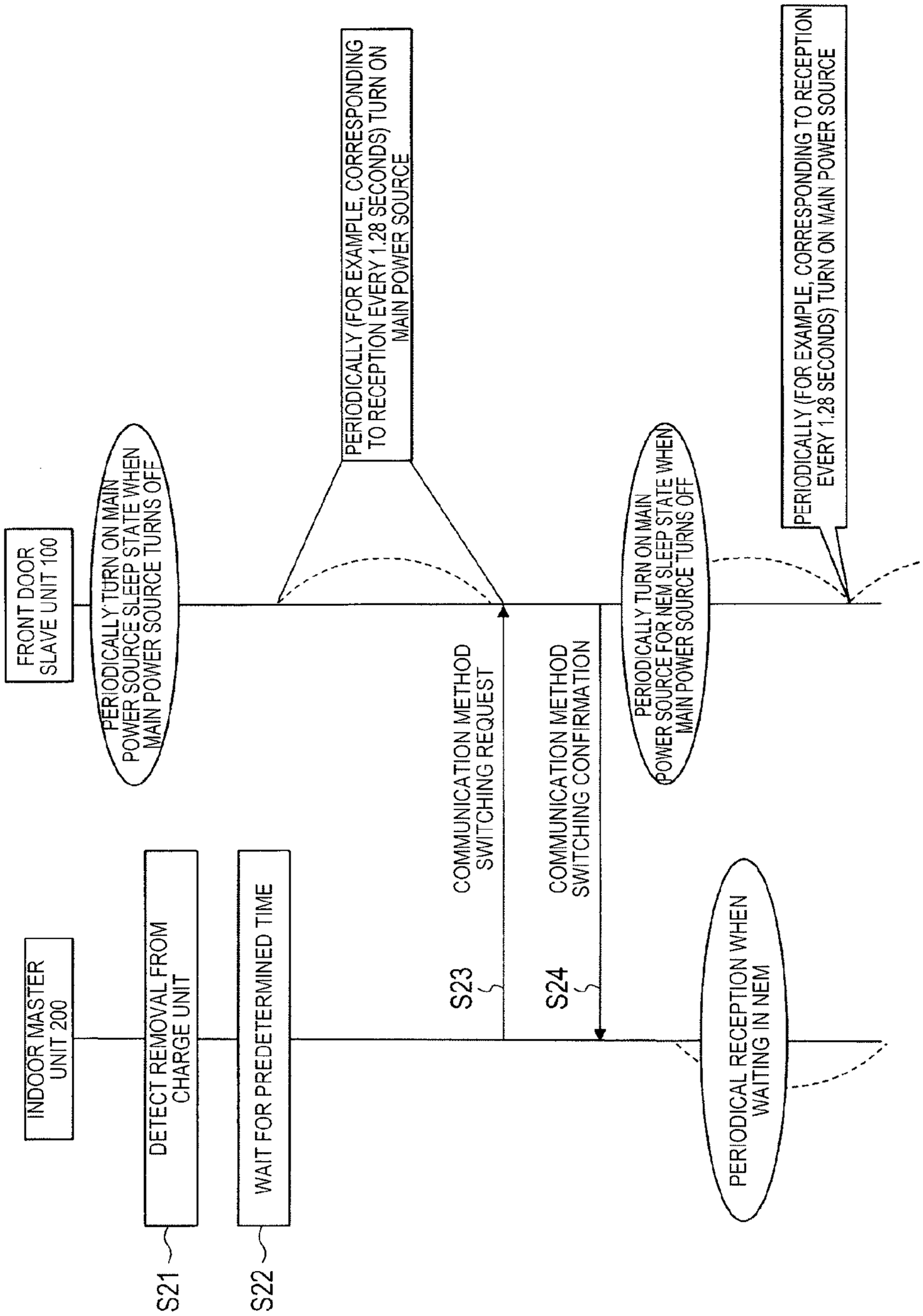

FRONT DOOR SLAVE UNIT 100
INDOOR MASTER UNIT 200
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
DETECT REMOVAL FROM CHARGE UNIT
WAIT FOR PREDETERMINED TIME
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
COMMUNICATION METHOD SWITCHING REQUEST
COMMUNICATION METHOD SWITCHING CONFIRMATION
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
PERIODICAL RECEPTION WHEN WAITING IN NEM
S21
S22
S23
S24

FIG. 12

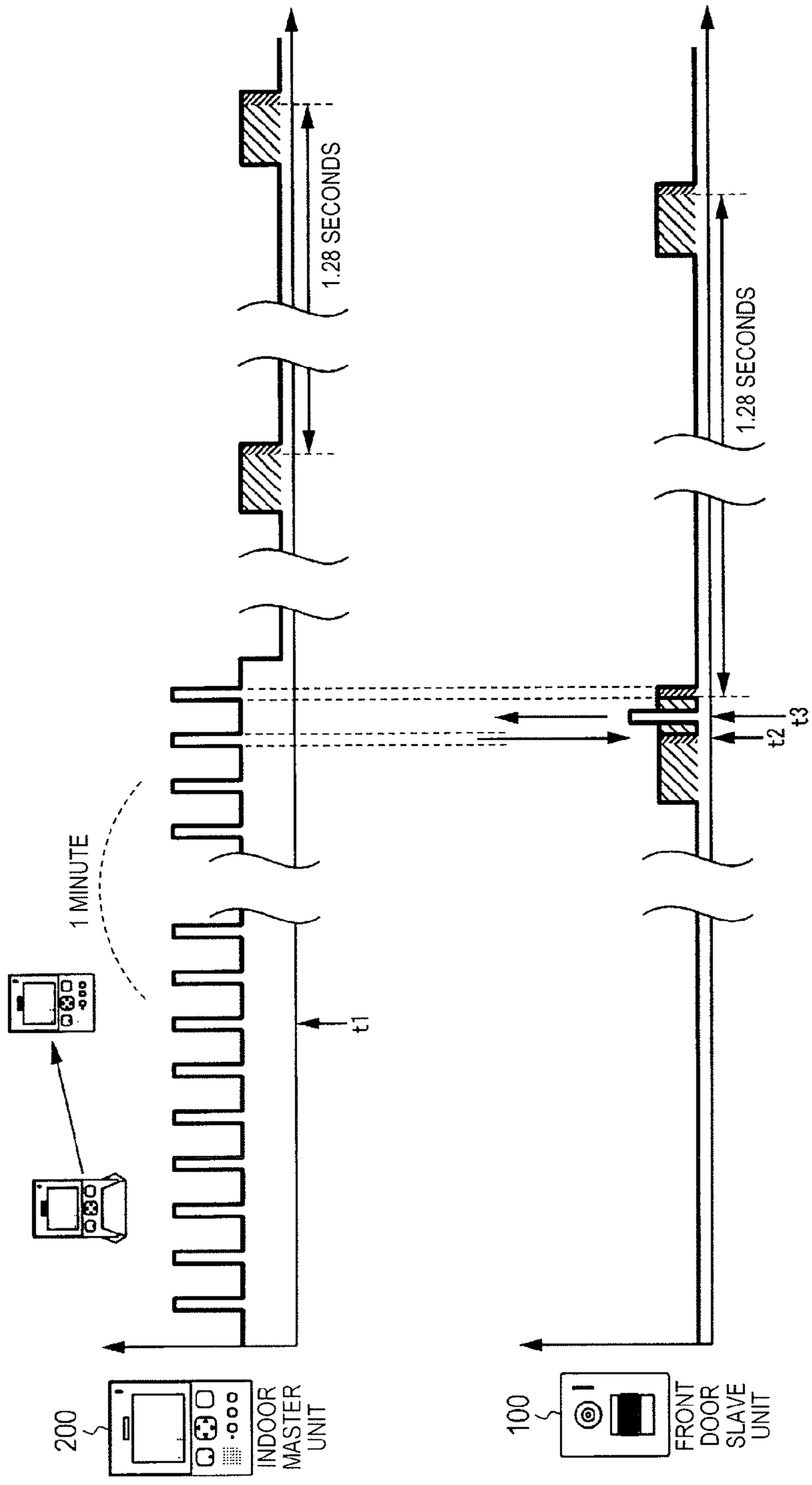

1.28 SECONDS
1.28 SECONDS
1 MINUTE
t1
t2
t3
200
INDOOR MASTER UNIT
100
FRONT DOOR SLAVE UNIT

FIG. 13

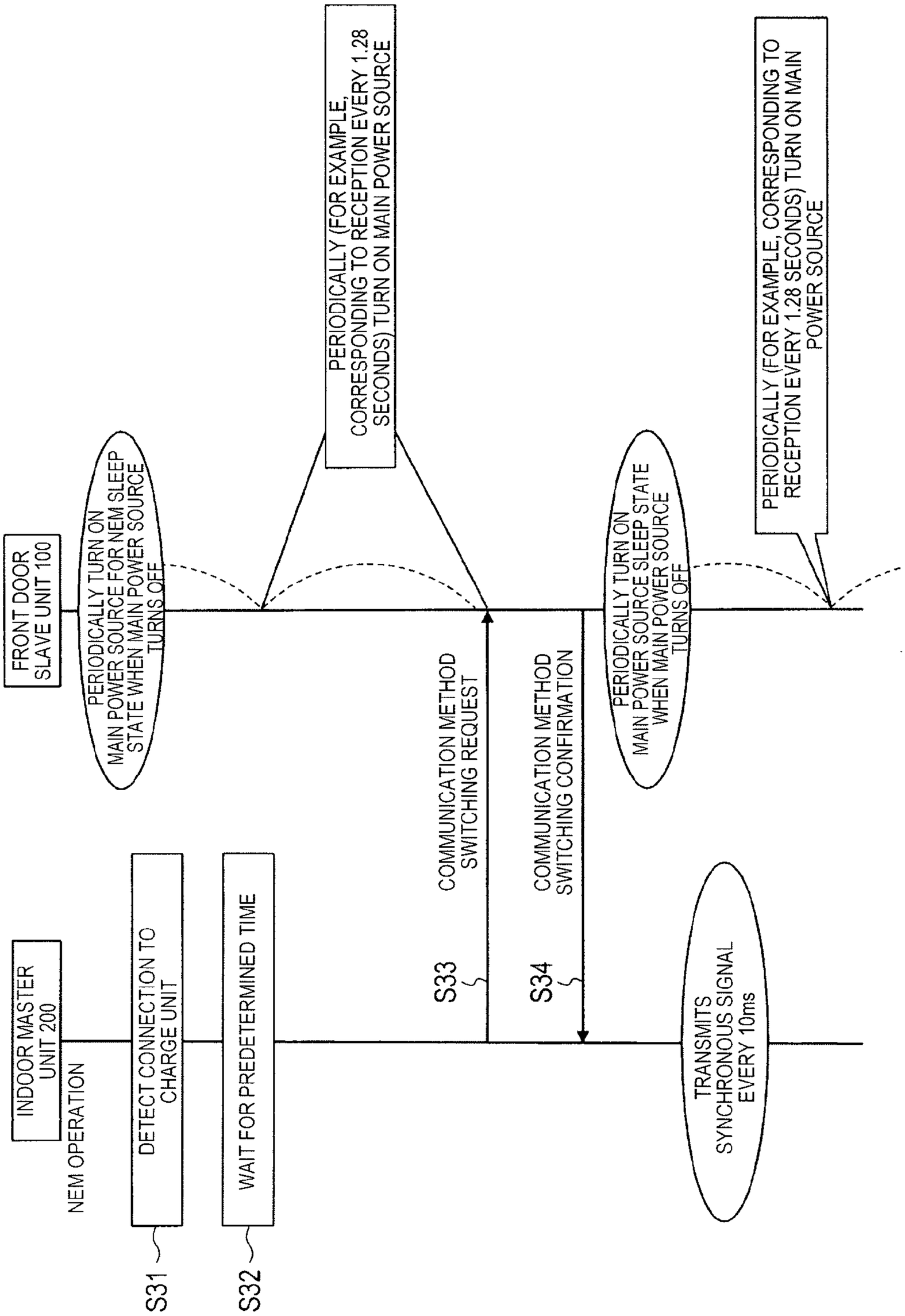

FRONT DOOR SLAVE UNIT 100
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
COMMUNICATION METHOD SWITCHING REQUEST
COMMUNICATION METHOD SWITCHING CONFIRMATION
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
INDOOR MASTER UNIT 200
NEM OPERATION
DETECT CONNECTION TO CHARGE UNIT
WAIT FOR PREDETERMINED TIME
S31
S32
S33
S34
TRANSMITS SYNCHRONOUS SIGNAL EVERY 10ms

FIG. 14

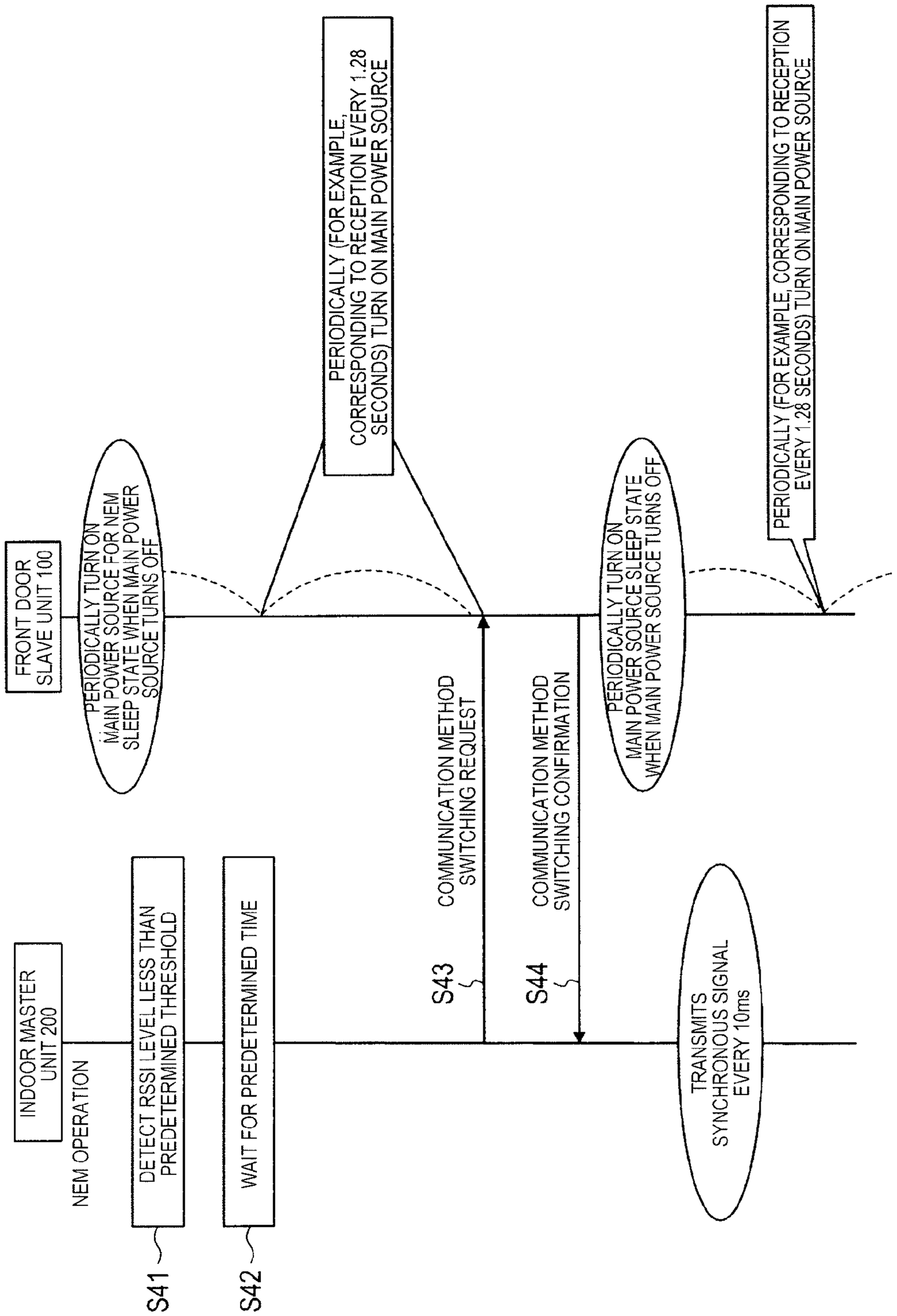
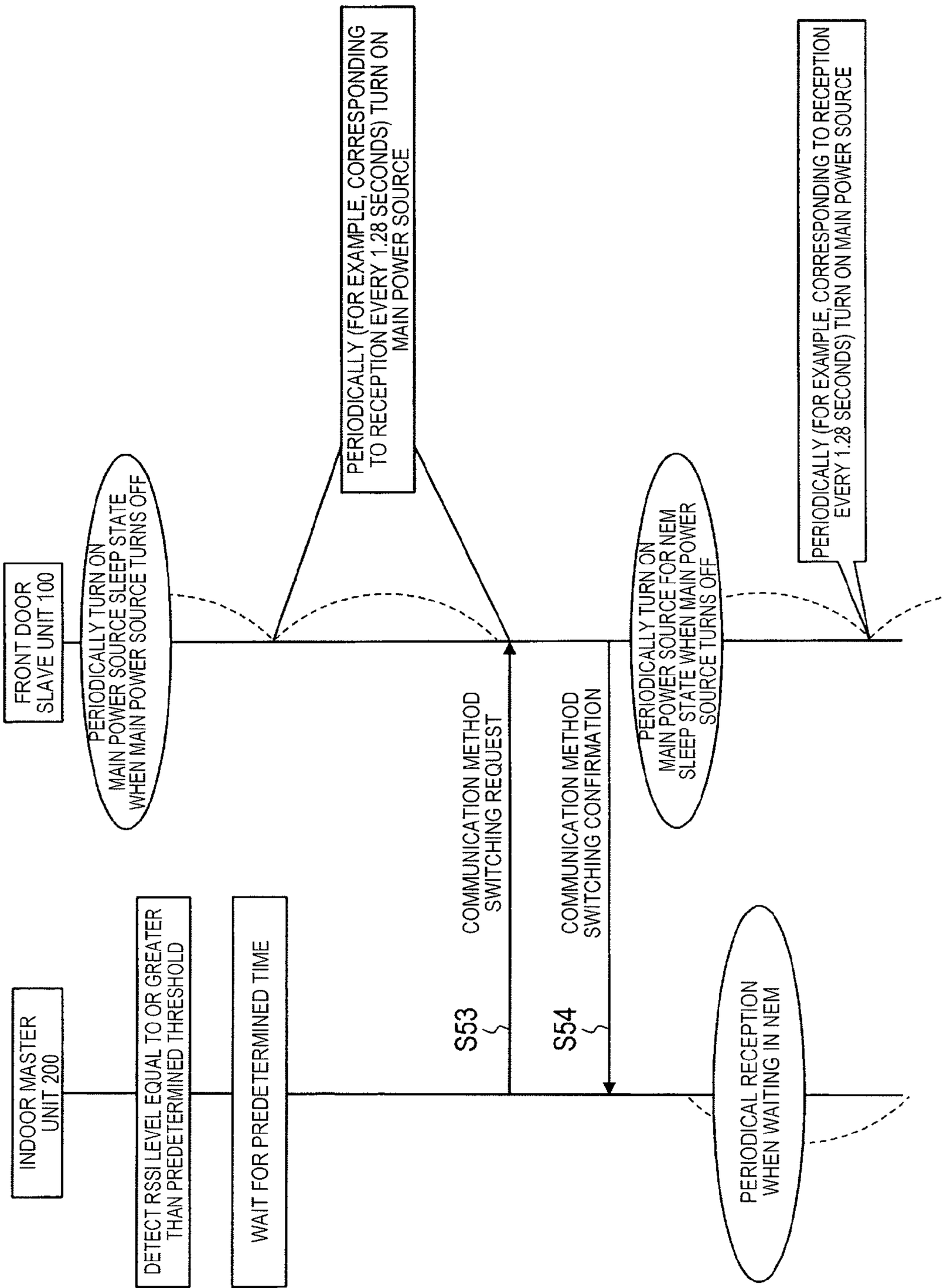

FRONT DOOR SLAVE UNIT 100
INDOOR MASTER UNIT 200
NEM OPERATION
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
DETECT RSSI LEVEL LESS THAN PREDETERMINED THRESHOLD
WAIT FOR PREDETERMINED TIME
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
COMMUNICATION METHOD SWITCHING REQUEST
COMMUNICATION METHOD SWITCHING CONFIRMATION
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
TRANSMITS SYNCHRONOUS SIGNAL EVERY 10ms
S41
S42
S43
S44

FIG. 15


FRONT DOOR SLAVE UNIT 100
INDOOR MASTER UNIT 200
PERIODICALLY TURN ON MAIN POWER SOURCE SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
DETECT RSSI LEVEL EQUAL TO OR GREATER THAN PREDETERMINED THRESHOLD
WAIT FOR PREDETERMINED TIME
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
COMMUNICATION METHOD SWITCHING REQUEST
COMMUNICATION METHOD SWITCHING CONFIRMATION
PERIODICALLY TURN ON MAIN POWER SOURCE FOR NEM SLEEP STATE WHEN MAIN POWER SOURCE TURNS OFF
PERIODICALLY (FOR EXAMPLE, CORRESPONDING TO RECEPTION EVERY 1.28 SECONDS) TURN ON MAIN POWER SOURCE
PERIODICAL RECEPTION WHEN WAITING IN NEM
S51
S52
S53
S54

VIDEO INTERCOM DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a video intercom device.

2. Description of the Related Art

In recent years, awareness of crime prevention has increased year by year, and requests have increased to realize front door slave units or the like with low cost and easy installation in a single household of one-room apartments or the like as well as detached houses.

So as to meet the request of the easy installation at such a low cost, a technique where wiring work between devices is unnecessary using wireless communication is becoming popular. For example, in Japanese Patent Unexamined Publication No. 2008-252271, a television intercom device provided with a front door slave unit and a wireless master unit that wirelessly communicates with the front door slave unit is disclosed.

SUMMARY OF THE INVENTION

A video intercom device according to an aspect of the present disclosure adopts a configuration where the video intercom device switches between a first communication method and a second communication method with electric power consumption lower than that of the first communication method, by the first communication method, an indoor master unit or a telephone master unit wirelessly communicates with a front door slave unit, the indoor master unit or the telephone master unit periodically transmitting a synchronization signal at all times and periodically performing a reception operation, and the front door slave unit transmitting a request by turning on a main power source when necessary, receiving the synchronization signal by periodically turning on the main power source, and entering a sleep state when the main power source turns off, and by the second communication method, the indoor master unit which transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off, wirelessly communicates with the front door slave unit which transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off, the indoor master unit includes a wireless communication unit that requests for switching from the first communication method to the second communication method to the front door slave unit when registering the front door slave unit, the telephone master unit includes a wireless communication unit that requests for switching from the second communication method to the first communication method to the front door slave unit when registering the front door slave unit, and the front door slave unit includes a control unit that switches to a communication method requested from the indoor master unit or the telephone master unit.

In addition, the video intercom device according to the aspect of the present disclosure adopts a configuration where the video intercom device switches between the first communication method and the second communication method with electric power consumption lower than that of the first communication method, by the first communication method, the indoor master unit or the telephone master unit wirelessly communicates with the front door slave unit, the indoor master unit or the telephone master unit periodically transmitting a synchronization signal at all times and periodically performing a reception operation, and the front door slave unit transmitting a request by turning on a main power source when necessary, receiving the synchronization signal by periodically turning on the main power source, and entering a sleep state when the main power source turns off, and by the second communication method, the indoor master unit which transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off, wirelessly communicates with the front door slave unit which transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off, the indoor master unit includes a wireless communication unit that requests for switching from the second communication method to the first communication method to the front door slave unit when additional installation of a relay antenna between the indoor master unit and the front door slave unit is detected, and the front door slave unit includes a control unit that switches to a communication method requested from the indoor master unit or the telephone master unit.

According to the present disclosure, it is possible to suppress electric power consumption.

In addition, according to this disclosure, it is possible to adopt a new wireless communication method with low electric power consumption and to maintain compatibility with related devices such as a relay antenna.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a diagram illustrating a video intercom device according to a first exemplary embodiment;

FIG. **2** is a block diagram illustrating a configuration example of a front door slave unit according to the first exemplary embodiment;

FIG. **3** is a block diagram illustrating a configuration example of an indoor master unit according to the first exemplary embodiment;

FIG. **4** is a block diagram illustrating a configuration example of a master unit according to the first exemplary embodiment;

FIG. **5** is a block diagram illustrating a configuration example of a smart phone according to the first exemplary embodiment;

FIG. **6** is a sequence diagram illustrating a procedure for switching from a first communication method to a second communication method when the indoor master unit registers the front door slave unit;

FIG. **7** is a diagram illustrating a state of change of current consumption in the front door slave unit and the indoor master unit or the master unit;

FIG. **8** shows diagrams illustrating an example of a setting screen of the indoor master unit;

FIG. **9** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when a relay antenna is additionally installed between the indoor master unit and the front door slave unit according to a second exemplary embodiment;

FIG. **10** is a diagram illustrating a state of change of current consumption in the front door slave unit and the indoor master unit;

FIG. **11** is a sequence diagram illustrating a procedure for switching from the first communication method to the second communication method when the indoor master unit is removed from a charge unit according to a third exemplary embodiment;

FIG. **12** is a diagram illustrating a state of change of current consumption in the front door slave unit and the indoor master unit;

FIG. **13** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when the indoor master unit is connected to the charge unit;

FIG. **14** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when a communication environment between the front door slave unit and the indoor master unit is deteriorated according to a fourth exemplary embodiment; and

FIG. **15** is a sequence diagram illustrating a procedure for switching from the first communication method to the second communication method when a communication environment between the front door slave unit and the indoor master unit is recovered.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before the description of the embodiment of the present invention, problems of the related art will be simply described. It is preferable to suppress electric power consumption so as to save the effort such as replacement of a battery or charging of the battery when a front door slave unit or a radio master unit is driven by the battery. In addition, there is also a case where it is needed to mount a new communication method for achieving low electric power consumption so as to suppress the electric power consumption. However, in this case, there is a problem that compatibility of wireless communication with related devices becomes incompatible. In particular, it is preferable that a relay antenna of the related devices can be connected so as to improve communication quality which can achieve a longer communication distance which is important in the wireless communication.

An object of the present invention is to provide a video intercom device suppressing electric power consumption, adopting a new wireless communication method with low electric power consumption, and maintaining compatibility with the related devices such as a relay antenna.

Hereinafter, embodiments of the present invention will be described in detail with reference to the drawings.

First Exemplary Embodiment

FIG. **1** is a diagram illustrating video intercom device **10** according to a first exemplary embodiment of the present invention. As illustrated in FIG. **1**, video intercom device **10** includes front door slave unit **100**, indoor master unit **200**, telephone master unit (hereinafter, simply referred to as "master unit") **300**, and smart phone **400**. Video intercom device **10** can be switched between a case where front door slave unit **100** is wirelessly connected with indoor master unit **200** and a case where front door slave unit **100** is wirelessly connected with master unit **300**. Master unit **300** can be wirelessly connected with smart phone **400**.

Configuration of Front Door Slave Unit

FIG. **2** is a block diagram illustrating a configuration example of front door slave unit **100** according to the first exemplary embodiment of the invention.

Front door slave unit **100** includes wireless communicator **101**, controller **102**, console **103**, power supply **104**, imaging section **105**, audio input and output section **106**, memory **107**, and interrupt detector **108**.

Wireless communicator **101** communicates with indoor master unit **200** or master unit **300** through a wireless channel. A communication method of wireless communicator **101**, for example, includes Digital Enhanced Cordless Telecommunications (DECT), wireless local area network (LAN), and ZigBee (registered trademark).

Wireless communicator **101** transmits a captured image to indoor master unit **200** or master unit **300**. With this, indoor residents can recognize the visitors present in the vicinity of the entrance door. In addition, wireless communicator **101** transmits voice information including voice of the visitors that is collected by audio input and output section **106** of front door slave unit **100** to indoor master unit **200** or master unit **300**. In addition, wireless communicator **101** receives voice information including the voice of residents from indoor master unit **200** or master unit **300**. With this, it is possible to make a phone call between an outdoor visitor and an indoor resident.

Controller **102** includes a read only memory (ROM), a random access memory (RAM), a central processing unit (CPU), or the like. For example, the CPU realizes various functions of controller **102** by executing a program stored in the ROM.

Controller **102** controls the entirety of front door slave unit **100**, and performs various kinds of control, calculation, and determination. Controller **102** performs calculation processing for controlling each section of front door slave unit **100**.

Console **103**, for example, is a call button. The presence of the visitor is notified to indoor master unit **200** or master unit **300** through wireless communicator **101** when the call button is pressed by the visitors.

Power supply **104** provides electric power for driving front door slave unit **100** to respective sections. Power supply **104** is configured with batteries such as primary batteries, rechargeable batteries, or the like in view of the installation. However, power supply **104** is not limited thereto. The electric power may be input from an AC power source or an AC adapter.

Imaging section **105** captures a predetermined area in outdoor. Image (captured image) captured by imaging section **105**, for example, includes video and still images, and the captured image includes image of visitors, passers, suspicious persons, objects other than a human, or the like.

Audio input and output section **106** is a microphone, a speaker, or the like, collects voice information including the sound of the visitors, and transmits information to indoor master unit **200** or master unit **300** through wireless communicator **101**. In addition, audio input and output section **106** outputs voice information including the voice of residents which is transmitted from indoor master unit **200** or master unit **300**.

Memory **107** is configured with a flash memory or the like, and for example stores device information of identification number or the like of front door slave unit **100**, setting information, state information of indoor master unit **200** or master unit **300**, a captured image before transmission to indoor master unit **200** or master unit **300**, or the like.

Interrupt detector **108** detects a key interrupt caused from a button or the like of front door slave unit **100**, an interrupt caused from a timer, and an interrupt caused from various events. The detection of the interrupt includes detection of an interrupt caused from a hardware or a software.

Interrupt detector **108** has also a function for controlling electric power supply to each section by power supply **104** so as to realize ultra low electric power consumption. For example, interrupt detector **108** is disposed between respective sections such as power supply **104**, controller **102**, or the like, on circuits and only interrupt detector **108** is driven by weak electric power from power supply **104** at all times. Accordingly, interrupt detector **108** turns on or off a switching element for supplying electric power to each section based on the detection of a predetermined interrupt.

Configuration of Indoor Master Unit

FIG. **3** is a block diagram illustrating a configuration example of indoor master unit **200** according to the first exemplary embodiment of the invention.

Indoor master unit **200** includes wireless communicator **201**, controller **202**, console **203**, power supply **204**, RSSI level detector **205**, display **206**, audio input and output section **207**, memory **208**, charge detector **209**, and interrupt detector **210**.

Wireless communicator **201** communicates with front door slave unit **100** through a radio channel. A communication method of wireless communicator **201**, for example, includes DECT, wireless LAN, or ZigBee (registered trademark).

Wireless communicator **201** receives a captured image from front door slave unit **100**. With this, indoor residents can recognize the visitors present in the vicinity of the entrance door. In addition, wireless communicator **201** receives voice information including the voice of the visitors from front door slave unit **100**. In addition, wireless communicator **201** transmits voice information including voice of the residents that is collected by audio input and output section **207** of indoor master unit **200** to front door slave unit **100**. With this, it is possible to make a phone call between an outdoor visitor and an indoor resident.

Controller **202** includes ROM, RAM, CPU, or the like. For example, the CPU realizes various functions of controller **202** by executing a program stored in the ROM. Controller **202** controls the entirety of indoor master unit **200**, and performs various kinds of control, calculation, and determination. Controller **202** performs calculation processing for controlling each section of indoor master unit **200**.

Console **203** includes various buttons such as a response button for responding to a case where the presence of the visitor is notified from front door slave unit **100**, a monitor button for acquiring a captured image from front door slave unit **100**, a button for controlling front door slave unit **100**, or the like.

Power supply **204** supplies electric power for driving indoor master unit **200** to respective sections. Power supply **204** may be applied as a case where the electric power from an AC power source or an AC adapter is input and a case where the power supply is configured with batteries such as primary batteries, rechargeable batteries, or the like in view of the installation.

RSSI level detector **205** detects strength, that is, a received signal strength indicator (RSSI) level of a signal that is received from front door slave unit **100** to wireless communicator **201**.

Display **206**, for example, includes a liquid crystal display (LCD), and displays various characters or images. The images, for example, include video and still images, a captured image from front door slave unit **100**, and images for operating indoor master unit **200**.

Audio input and output section **207** is a microphone, a speaker, or the like, collects voice information including the sound of the residents, and transmits information to front door slave unit **100** through wireless communicator **201**. In addition, audio input and output section **207** outputs voice information including the voice of residents which is transmitted from front door slave unit **100**.

Memory **208** is configured with a flash memory or the like, for example, and includes various images or audio, and other management information. The images, for example, include video and still images, captured images from front door slave unit **100**, and images for operating indoor master unit **200**. The audio, for example, includes audio of a fixed form message generated from indoor master unit **200**.

The other management information, for example, includes password information so as to not arbitrarily change various setting information of indoor master unit **200**.

Charge detector **209** detects whether or not indoor master unit **200** is connected to a charge unit such as a charging stand or the like, and power supply **204** is connected to an external power source.

Interrupt detector **210** detects a key interrupt caused from a button or the like of indoor master unit **200**, an interrupt caused from a timer, and an interrupt caused from various events. The detection of the interrupt includes detection of an interrupt caused from a hardware or a software.

Interrupt detector **210** has also a function for controlling electric power supply to each section by power supply **204** so as to realize ultra low electric power consumption. For example, interrupt detector **210** is disposed between respective sections such as power supply **204**, controller **202**, or the like, on circuits and only interrupt detector **210** is driven by weak electric power from power supply **204** at all times. Accordingly, interrupt detector **210** turns on or off a switching element for supplying the electric power to each section based on the detection of a predetermined interrupt.

Configuration of Master Unit

FIG. **4** is a block diagram illustrating a configuration example of master unit **300** according to the first exemplary embodiment of the invention.

Fixed-line I/F unit **301** is connected to fixed telephone network **85**. With this, master unit **300** can call up an external fixed telephone that is connected to fixed telephone network **85**.

Audio input/output control unit **304** is connected to audio data bus **317**, and controls microphone **328** and speaker **329**. Microphone **328** collects voice information including a voice of residents, and transmits the information to front door slave unit **100** through DECT protocol control unit **308** and DECT I/F unit **307**. Speaker **329** outputs voice information including a voice of visitors that is transmitted from front door slave unit **100**.

Console **305** includes various buttons or a touch panel, for example, a dial button, a function button, a speed button, a hold button, or the like.

Display **306**, for example, includes a liquid crystal display (LCD), and displays various characters or images. The images, for example, include video and still images, a captured image from front door slave unit **100**.

DECT protocol control unit **308** performs wireless connection with front door slave unit **100** and a telephone slave unit (not shown) through DECT I/F unit **307** using the DECT wireless method.

Controller **309** controls the entirety of master unit **300**, and performs various kinds of control, calculation, and determination. In addition, Controller **309** includes call control unit **310** and audio stream processing unit **312**, call

control unit **310** performs control of a phone call, and audio stream processing unit **312** performs audio data processing or the like.

Image memory control unit **315** controls image memory **316**, and stores image data or the like which is captured in front door slave unit **100** in image memory **316**.

Wireless LAN control unit **321** transmits or receives image data and audio data to or from smart phone **400** through a wireless router that is connected with wireless LAN I/F unit **322** using wireless LAN.

Handset/mobile terminal charge unit **326** includes an outlet or a connection plug, and charges the telephone slave unit or smart phone **400** that is connected to the outlet or the connection plug.

USB communication I/F unit **327** transmits and receives data by being connected to a device, a memory, or the like having an interface of the universal serial bus (USB) standard.

In addition, master unit **300** registers smart phone **400** and a wireless router in advance.

Configuration of Smart Phone

FIG. **5** is a block diagram illustrating a configuration example of smart phone **400** according to the first exemplary embodiment of the invention.

3G protocol control unit **402** performs wireless connection with a mobile phone or another smart phone that is connected to a mobile phone network through 3G communication I/F unit **401** using the 3G (the third generation) wireless communication technology.

Touch panel **403** is a display input unit in which a display and a console are integrated, displays information such as an image, an icon, or the like on a screen, and receives a tap operation (or touch operation) of the screen by a user.

Memory **404** is configured with a flash memory or the like, and stores various images, audio, other management information, or the like. The images, for example, include video and still images, a captured image from front door slave unit **100**, and images for operating smart phone **400**. The audio, for example, includes audio of a fixed form message generated from smart phone **400**.

Audio input/output control unit **405** is connected to audio data bus **415**, and controls microphone **412** and speaker **413**. Microphone **412** collects voice information including audio, and transmits the voice information to front door slave unit **100** through wireless LAN control unit **407** and wireless LAN I/F unit **408**. Speaker **413** outputs voice information including a voice of visitors that is transmitted from front door slave unit **100**.

Controller **406** includes a ROM, a RAM, a CPU, or the like. For example, the CPU realizes various functions of controller **406** by executing a program stored in the ROM. Controller **406** controls the entirety of smart phone **400**, and performs various kinds of control, calculation, and determination. In addition, controller **406** embeds monitoring control unit **414** capable of setting a function of front door slave unit **100** therein.

Wireless LAN control unit **407** transmits or receives image data and audio data to or from master unit **300** or the like through a wireless router that is connected with wireless LAN I/F unit **408** using a wireless LAN.

USB communication I/F unit **411** transmits and receives data by being connected to a device, a memory, or the like having an interface of the universal serial bus (USB) standard.

Secondary battery **450** is a battery to be charged, and supplies electric power to each unit of smart phone **400**.

Communication Method

Next, a communication method of video intercom device **10** described above will be described.

The first communication method is a method by which indoor master unit **200** or master unit **300** wirelessly communicates with front door slave unit **100**. Indoor master unit **200** or master unit **300** periodically transmits a synchronization signal at all times and periodically performs a reception operation. Front door slave unit **100** transmits a request by turning on a main power source when necessary, receives the synchronization signal by periodically turning on the main power source, and enters a sleep state when the main power source turns off. The sleep state of front door slave unit **100** is a state where only a minimum circuit block for turning on the main power source is biased with ultra low current consumption when the main power source turns off. It is considered that a call button of front door slave unit **100** is pressed according to the necessity of front door slave unit **100**. In addition, front door slave unit **100** may transmit a request by turning on the main power source only when necessary, and may enter the sleep state when the main power source turns off.

The second communication method is a method by which indoor master unit **200** wirelessly communicates with front door slave unit **100**. Indoor master unit **200** transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off. Front door slave unit **100** transmits a request by turning on the main power source when necessary, and receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off. In addition, front door slave unit **100** may transmit a request by turning on the main power source only when necessary, and may enter the sleep state when the main power source turns off. In addition, indoor master unit **200** may transmit the synchronization signal with a longer interval than a reception interval of front door slave unit **100**, and front door slave unit **100** may receive the synchronization signal with the longer interval by periodically turning on the main power source, and may enter the sleep state when the main power source turns off. In order to apply a communication method where a no emission mode (NEM) is used in which the synchronous signal and all other signals are not transmitted when waiting, or the synchronization signal with a longer interval than a reception interval of front door slave unit **100** is transmitted by turning on the main power source only when necessary, since the second communication method can reduce electric power consumption of a transmission operation that uses large electric power consumption compared to the first communication method, it is possible to suppress electric power consumption.

Switching of Communication Method

FIG. **6** is a sequence diagram illustrating a procedure for switching from the first communication method to the second communication method when indoor master unit **200** registers front door slave unit **100**. Here, first, it is assumed to use the first communication method in a state (registered state) where first master unit **300** has registered front door slave unit **100**.

In step S**01**, master unit **300** releases the registration of front door slave unit **100**, and in step S**02**, indoor master unit **200** enters a registered state by performing an operation (registration operation) for registering front door slave unit **100**. In this case, it is assumed that front door slave unit **100** and indoor master unit **200** use the first communication method.

In step S03, indoor master unit **200** transmits a communication switching request for switching to the second communication method to front door slave unit **100**, and in step S04, front door slave unit **100** transmits a switching confirmation for the second communication method to indoor master unit **200** and is switched to the second communication method.

With this, indoor master unit **200** receives signals by periodically turning on the main power source when the system of the embodiment enters the sleep state, and periodically receives signals because the main power source turns on at all times when the system does not enter the sleep state. In addition, front door slave unit **100** periodically turns on the main power source for the NEM, and enters the sleep state when the main power source turns off.

FIG. **7** is a diagram illustrating a state of change of current consumption in front door slave unit **100** and indoor master unit **200** or master unit **300**. This figure illustrates a case where master unit **300** releases the registration of front door slave unit **100**, indoor master unit **200** performs a registration operation of front door slave unit. **100** when master unit **300**, and front door slave unit **100** are set in the first communication method.

Indoor master unit **200** performs a registration operation of front door slave unit **100** at time t**1**, and indoor master unit **200** transmits a switching request for the second communication method at time t**2** and front door slave unit **100** receives the switching request at a timing where the main power source turns on.

At time t**3**, front door slave unit **100** transmits a communication method switching confirmation to indoor master unit **200** and is switched to the second communication method. In addition, it is assumed that indoor master unit **200** enters the sleep state where the main power source turns off. With this, it is possible to significantly reduce a bias current when the main power source turns off.

FIG. **8** shows diagrams illustrating an example of a setting screen of indoor master unit **200**. The resident presses a menu button or a selection button, selects "registration/removal" that is displayed on display **206** as illustrated in (a) in FIG. **8**, and decides an item by pressing a decision button.

The resident presses a selection button, selects "registration" that is displayed on display **206** as illustrated in (b) in FIG. **8**, and decides an item by pressing the decision button.

The resident presses a selection button, selects "front door slave unit" that is displayed on display **206** as illustrated in (c) in FIG. **8**, and decides the front door slave unit by pressing the decision button. In addition, a setting illustrated in FIG. **8** can be performed in the same manner even in smart phone **400**.

In this way, video intercom device **10** according to the first exemplary embodiment periodically transmits a synchronous signal at all times and is switched from the first communication method to the second communication method when indoor master unit **200** registers front door slave unit **100**. The first communication method is a method by which indoor master unit **200** or master unit **300** that periodically performs a reception operation is synchronized with front door slave unit **100** that transmits a request by turning on the main power source when necessary, receives the synchronous signal by periodically turning on the main power source, and enters the sleep state when the main power source turns off. The second communication method is a method by which indoor master unit **200** wirelessly communicates with front door slave unit **100**. Indoor master unit **200**, for example, transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off. Front door slave unit **100** transmits a request by turning on the main power source when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off. With this, it is possible to suppress electric power consumption of indoor master unit **200**.

In addition, in the present embodiment it is described that indoor master unit **200** is switched from the first communication method to the second communication method when registering front door slave unit **100**. However, the present invention is not limited thereto. For example, telephone master unit **300** may be switched from the second communication method to the first communication method when registering front door slave unit **100**.

Second Exemplary Embodiment

In a second exemplary embodiment of the present invention, a case where a relay antenna additionally installed between both of indoor master unit **200** and front door slave unit **100** will be described in a state where indoor master unit **200** registers front door slave unit **100**.

Since a configuration of front door slave unit **100** and indoor master unit **200** according to the second exemplary embodiment is the same as FIGS. **2** and **3** of the first exemplary embodiment, the description is incorporated to these figures, and the overlap will be omitted, if necessary.

FIG. **9** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when a relay antenna is additionally installed between indoor master unit **200** and front door slave unit **100**. Here, first, it is assumed that indoor master unit **200** uses the NEM of the second communication method and periodically receives signals.

In step S**11**, indoor master unit **200** detects additional installation start of a relay antenna, and in step S**12**, indoor master unit **200** detects additional installation completion of the relay antenna.

In step S**13**, indoor master unit **200** transmits a communication method switching request, to front door slave unit **100**, for switching to the first communication method at a timing where front door slave unit **100** starts, and in step S**14**, front door slave unit **100** transmits a switching confirmation for the first communication method to indoor master unit **200**, and is switched to the first communication method.

FIG. **10** is a diagram illustrating a state of change of current consumption in front door slave unit **100** and indoor master unit **200**. Indoor master unit **200** transmits a communication method switching request for the first communication method to entire slots at times t**2** to t**3** (for example, approximately 1.3 seconds longer than 1.28 seconds that is a reception interval of front door slave unit **100**. It is possible to surely supplement a reception period of front door slave unit **100** if approximately 1.3 seconds.) when additional installation of the relay antenna is completed at time t**1**. The communication method switching request that is transmitted from indoor master unit **200** is received in front door slave unit **100** at time t**3**, front door slave unit **100** transmits a communication method switching confirmation to indoor master unit **200** at time t**4**, and indoor master unit **200** is switched to the first communication method. In this way, when the relay antenna is additionally installed, switching to the first communication method is caused because the relay antenna is applied to the first communication method and not applied to the second communication method.

In this way, in the video intercom device according to the second exemplary embodiment, it is possible to lengthen a

communication distance between front door slave unit **100** and indoor master unit **200** and to improve communication quality using a relay antenna that is applied to the first communication method by being switched from the second communication method to the first communication method when the relay antenna is additionally installed between front door slave unit **100** and indoor master unit **200**.

Third Exemplary Embodiment

In a third exemplary embodiment according to the present invention, a case where indoor master unit **200** is removed from a charge unit or connected to the charge unit will be described.

Since a configuration of front door slave unit **100** and indoor master unit **200** according to the third exemplary embodiment is the same as FIGS. **2** and **3** of the first exemplary embodiment, the description is incorporated to these figures, and the overlap will be omitted, if necessary.

FIG. **11** is a sequence diagram illustrating a procedure for switching from the first communication method to the second communication method when indoor master unit **200** is removed from a charge unit. Here, first, it is assumed that indoor master unit **200** is connected to a charge unit.

In step S**21**, indoor master unit **200** detects the removal from the charge unit, and in step S**22**, indoor master unit **200** waits for a predetermined time (for example, 1 minute). This is to exclude a case where indoor master unit **200** immediately returns to the charge unit after indoor master unit **200** is removed from the charge unit.

In step S**23**, indoor master unit **200** transmits a communication method switching request for switching to the second communication method to front door slave unit **100** at a timing where front door slave unit **100** starts, and in step S**24**, front door slave unit **100** transmits a switching confirmation for the second communication method to indoor master unit **200** and is switched to the second communication method.

With this, indoor master unit **200** periodically performs reception when waiting, and front door slave unit **100** periodically turns on the main power source for the NEM, and enters the sleep state when the main power source turns off.

FIG. **12** is a diagram illustrating a state of change of current consumption in front door slave unit **100** and indoor master unit **200**. Indoor master unit **200** waits for 1 minute when indoor master unit **200** has been removed from the charge unit at time t**1**, and then indoor master unit **200** transmits a switching request for the second communication method at time t**2** and front door slave unit **100** receives the switching request.

Front door slave unit **100** transmits a communication method switching confirmation to indoor master unit **200** and is switched to the second communication method at time t**3**.

In this way, it is possible to suppress electric power consumption of the battery of indoor master unit **200** that is removed from the charge unit and to lengthen a waiting time of indoor master unit **200** by being switched from the first communication method to the second communication method when indoor master unit **200** is removed from the charge unit.

FIG. **13** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when indoor master unit **200** is connected to the charge unit. Here, first, it is assumed that indoor master unit **200** is removed from the charge unit.

In step S**31**, indoor master unit **200** detects the connection to the charge unit, and in step S**32**, indoor master unit **200** waits for a predetermined time (for example, 1 minute). This is to exclude a case where indoor master unit **200** is immediately removed from the charge unit after indoor master unit **200** is connected to the charge unit.

In step S**33**, indoor master unit **200** transmits a communication method switching request for switching to the first communication method to front door slave unit **100** at a timing where front door slave unit **100** starts, and in step S**34**, front door slave unit **100** transmits a switching confirmation for the first communication method to indoor master unit **200** and is switched to the first communication method.

With this, indoor master unit **200** periodically transmits a synchronous signal every 10 ms at all times and periodically receives signals, and front door slave unit **100** transmits a request by turning on the main power source when necessary, receives the synchronous signal by periodically turning on the main power source, and enters the sleep state when the main power source turns off.

In this way, it is possible to perform stable synchronous communication by which indoor master unit **200** transmits a synchronous signal at a short interval at all times and to favorably maintain communication quality by being switched from the second communication method to the first communication method when indoor master unit **200** is connected to the charge unit.

In this way, in the video intercom device according to the third exemplary embodiment, it is possible to suppress electric power consumption and to lengthen a waiting time of indoor master unit **200** by being switched from the first communication method to the second communication method when indoor master unit **200** is removed from the charge unit. Meanwhile, it is possible to favorably maintain communication quality by being switched from the second communication method to the first communication method when indoor master unit **200** is connected to the charge unit.

Fourth Exemplary Embodiment

In a fourth exemplary embodiment according to the present invention, a case where a communication environment between front door slave unit **100** and indoor master unit **200** is deteriorated or recovered will be described.

Since a configuration of front door slave unit **100** and indoor master unit **200** according to the fourth exemplary embodiment is the same as FIGS. **2** and **3** of the first exemplary embodiment, the description is incorporated to these figures, and the overlap will be omitted, if necessary.

FIG. **14** is a sequence diagram illustrating a procedure for switching from the second communication method to the first communication method when the communication environment between front door slave unit **100** and indoor master unit **200** is deteriorated.

In step S**41**, indoor master unit **200** detects that RSSI (reception signal strength indicator) is less than a predetermined threshold by being decreased the RSSI, and in step S**42**, indoor master unit **200** waits for a predetermined time (for example, 1 minute). This is to exclude a case where indoor master unit **200** is immediately recovered from a reception signal strength after the reception signal strength is decreased.

In step S**43**, indoor master unit **200** transmits a communication method switching request for switching to the first communication method to front door slave unit **100** at a timing where front door slave unit **100** starts, and in step S**44**, front door slave unit **100** transmits a switching confirmation for the first communication method to indoor master unit **200** and is switched to the first communication method.

With this, indoor master unit **200** periodically transmits a synchronous signal every 10 ms at all times and periodically

receives signals, and front door slave unit **100** transmits a request by turning on the main power source when necessary, receives the synchronous signal by periodically turning on the main power source, and enters the sleep state when the main power source turns off.

FIG. **15** is a sequence diagram illustrating a procedure for switching from the first communication method to the second communication method when the communication environment between front door slave unit **100** and indoor master unit **200** is recovered.

In step S**51**, indoor master unit **200** detects that the reception signal strength is equal to or greater than a predetermined threshold by being recovered the reception signal strength, and in step S**52**, indoor master unit **200** waits for a predetermined time (for example, 1 minute).

In step S**53**, indoor master unit **200** transmits a communication method switching request for switching to the second communication method to front door slave unit **100** at a timing where front door slave unit **100** starts, and in step S**54**, front door slave unit **100** transmits a switching confirmation for the second communication method to indoor master unit **200** and is switched to the second communication method.

With this, indoor master unit **200** transmits a request by turning on the main power source only when necessary, receives signals by periodically turning on the main power source for the NEM when waiting, and enters the sleep state when the main power source turns off. Front door slave unit **100** transmits a request by periodically turning on the main power source for the NEM when necessary, receives signals by periodically turning on the main power source when waiting, and enters the sleep state when the main power source turns off.

In this way, in the video intercom device according to the fourth exemplary embodiment, it is possible to recover a reception signal strength and to preferably maintain communication quality by being switched from the second communication method to the first communication method when the reception signal strength of indoor master unit **200** decreases to less than a predetermined threshold. Meanwhile, it is possible to suppress electric power consumption and to lengthen a waiting time of indoor master unit **200** by being switched from the first communication method to the second communication method when the reception signal strength of indoor master unit **200** recovers to equal to or greater than a predetermined threshold.

In addition, in the present embodiment, a case where communication methods are switched to each other when the reception signal strength decreases or recovers is described. However, the communication method may be switched when the number of available communication slots is less than a prescribed number or equal to or greater than the prescribed number. Here, the number of the available communication slots is, for example, the number of slots where a reception signal strength (that is, signal strength other than communication) of an interference level among the communication slots is equal to or less than a certain threshold. Specific examples include the following example in which communication methods are switched when the number of the available communication slots is less than the prescribed number or equal to or greater than the prescribed number. Switching to the first communication method is performed by determining that there is a lot of interference when the number of available communication slots is less than a prescribed number that is set as a setting value (for example, 2) in advance. Switching to the second communication method is performed by determining that there is less interference when the number of available communication slots is equal to or greater than the prescribed number that is set as the setting value in advance. With this, it is possible to realize a low consumption electric power system corresponding to a wireless interference environment.

The video intercom device according to the present invention is useful for suppressing the electric power consumption.

What is claimed is:

1. A video intercom device, comprising:

a front door slave unit; and

an indoor master unit or a telephone master unit that performs wireless communication with the front door slave unit,

wherein when the front door slave unit is registered in the indoor master unit, the indoor master unit transmits a switching requesting signal for switching to a second communication method with electric power consumption lower than that of a first communication method to the front door slave unit, and is switched from the first communication method by which a synchronous signal is periodically transmitted to the front door slave unit and a signal is periodically received from the front door slave unit, to the second communication method by which a signal is transmitted to the front door slave unit when necessary and a signal is periodically received from the front door slave unit when waiting,

wherein when the switching requesting signal is received, the front door slave unit is switched from the first communication method by which a signal is transmitted to the indoor master unit when necessary and the synchronous signal is received from the indoor master unit by periodically turning on a main power source when waiting, to the second communication method by which a signal is transmitted to the indoor master unit when necessary and a signal is received from the indoor master unit by periodically turning on the main power source when waiting,

wherein the indoor master unit includes a reception signal strength detector that detects strength of a signal received from the front door slave unit, and requests for switching from the second communication method to the first communication method to the front door slave unit when the reception signal strength detector detects that the strength is less than a predetermined threshold, and

wherein the indoor master unit requests for switching from the first communication method to the second communication method to the front door slave unit when the reception signal strength detector detects that the strength is equal to or greater than a predetermined threshold.

2. The video intercom device of claim **1**,

wherein when the front door slave unit is registered in the telephone master unit, the telephone master unit transmits a switching requesting signal for switching from the second communication method to the first communication method to the front door slave unit, and is switched from the second communication method to the first communication method, and

wherein when the switching requesting signal is received, the front door slave unit is switched from the second communication method to the first communication method.

3. The video intercom device of claim **1**,

wherein the indoor master unit includes a charge detector that detects whether or not the indoor master unit is

connected to a charge unit, and requests for switching from the second communication method to the first communication method to the front door slave unit when the charge detector detects that the indoor master unit is connected to the charge unit.

4. The video intercom device of claim **3**,

wherein the indoor master unit requests for switching from the first communication method to the second communication method to the front door slave unit when the charge detector detects that the indoor master unit is removed from the charge unit.

5. The video intercom device of claim **1**,

wherein the indoor master unit includes a reception signal strength detector that detects strength of a signal received from the front door slave unit, and requests for switching from the second communication method to the first communication method to the front door slave unit when the reception signal strength detector detects that the number of available communication slots is less than a prescribed number.

6. The video intercom device of claim **5**,

wherein the indoor master unit requests for switching from the first communication method to the second communication method to the front door slave unit when the reception signal strength detector detects that the number of available communication slots is equal to or greater than a prescribed number.

7. The video intercom device of claim **1**,

wherein the indoor master unit transmits a signal to the front door slave unit by turning on the main power source only when necessary, in the second communication method.

8. The video intercom device of claim **7**,

wherein the indoor master unit receives a signal from the front door slave unit by periodically turning on the main power source when waiting, and enters a sleep state when the main power source turns off, in the second communication method.

9. The video intercom device of claim **1**,

wherein the front door slave unit transmits a signal to the indoor master unit by turning on the main power source only when necessary, and enters the sleep state when the main power source turns off, in the first and second communication methods.

10. The video intercom device of claim **1**,

wherein in the second communication method, the indoor master unit becomes a no emission mode (NEM) in which a synchronous signal and all other signals are not transmitted when waiting.

11. The video intercom device of claim **1**,

wherein the indoor master unit transmits a switching requesting signal for switching from the second communication method to the first communication method to the front door slave unit when detecting that a relay antenna is additionally installed between the front door slave unit and the indoor master unit, and

wherein the front door slave unit is switched to a communication method requested from the indoor master unit when the switching requesting signal is received.

12. A video intercom device, comprising:

a front door slave unit; and

an indoor master unit or a telephone master unit that performs wireless communication with the front door slave unit,

wherein when the front door slave unit is registered in the indoor master unit, the indoor master unit transmits a switching requesting signal for switching to a second communication method with electric power consumption lower than that of a first communication method to the front door slave unit, and is switched from the first communication method by which a synchronous signal is periodically transmitted to the front door slave unit and a signal is periodically received from the front door slave unit, to the second communication method by which a signal is transmitted to the front door slave unit when necessary and a signal is periodically received from the front door slave unit when waiting, wherein when the switching requesting signal is received, the front door slave unit is switched from the first communication method by which a signal is transmitted to the indoor master unit when necessary and the synchronous signal is received from the indoor master unit by periodically turning on a main power source when waiting, to the second communication method by which a signal is transmitted to the indoor master unit when necessary and a signal is received from the indoor master unit by periodically turning on the main power source when waiting,

wherein, in the second communication method, the indoor master unit transmits a synchronous signal with an interval longer than a reception interval of the front door slave unit to the front door slave unit, and

wherein the front door slave unit receives the synchronous signal with the interval longer than the reception internal of the front door slave unit by periodically turning on the main power source, and enters the sleep state when the main power source turns off.

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